On Embedded Implicatures*

Uli Sauerland

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Abstract

The Gricean approach explains implicatures by assumptions about the pragmatics of entire utterances. The phenomenon of embedded implicatures remains a challenge for this approach since in such cases apparently implicatures contribute to the truth-conditional content of constituents smaller than utterances. In this paper, I investigate three areas where embedded implicatures seem to differ from implicatures at the utterance level: optionality, epistemic status, and implicated presuppositions. I conclude that the differences between the two kinds of implicatures justify an approach that maintains Gricean assumptions at the utterance level, and assumes a special operator for embedded implicatures.

Implicatures has been debated ever since Grice introduced the term in 1967 (Grice 1989). In this paper, I consider the case of scalar implicatures (Horn 1972). Scalar implicatures have been an important topic especially in the recent literature in cognitive science after the discovery of Noveck (2001) that children systematically fail

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to exhibit knowledge of scalar implicatures in language acquisition experiments (see also Papafragou & Musolino (2003), Gualmini et al. (2001)). While such findings do not help to resolve the question what kind of mechanism gives rise to scalar implicatures, they corroborate the Gricean assumption that scalar implicatures form a uniform class of phenomena. Furthermore, these acquisition results make it all the more necessary to understand the theory of scalar implicatures. This paper is an effort in this direction: It seeks to clarify the relationship of global scalar implicatures and the phenomenon of embedded implicatures.

Two examples of scalar implicatures are (1) and (2). (1) is judged inaccurate in a situation where the Philharmonic played all nine of Beethoven's symphonies. Similary, (2) is judged false (or at least misleading) in case I knowingly saw both Elvis and Bobby Fischer at the airport. In both (1) and (2), the implicatures (preceeded by $\rightsquigarrow$) are defeasible inferences, which distinguishes implicatures from entailments.

(1) The Philharmonic played many of Beethoven's symphonies.
$\rightsquigarrow$ The Philharmonic didn't play all nine.

(2) I saw Elvis or Bobby Fischer at the airport.
$\rightsquigarrow$ I didn't see both Elvis and Fischer.

The present paper addresses the question which processes give rise to scalar implicatures. The two most important points of view concerning this mechanism are the global and the local view. On the one hand, the global view assumes that implicatures always result from a comparison of the actual utterance with certain alternative sentences that were not uttered. The basis of the comparison is Grice's maxim of quantity---make the most informative statement that you know to be true. For example (1), the sentence with all instead of many would have been more informative in case the Philharmonic actually played all of Beethoven's symphonies. Therefore, (1) implicates that not all of the symphonies were played. Similarly, the alternative sentence with and instead of or is more informative than (2), and the use of (2) implicates that the sentence with and is false.

The local view, on the other hand, assumes that implicatures as computed, not only after the truth-conditions of an utterance were determined, but also during the process of determining the truth-conditions. On this view, implicatures are not necessarily restricted to the root level of the utterance as they are on the global account. Indeed, this empirical prediction seems to be borne out by the phenomenon of Embedded Implicatures (Recanati 2003). Here I adopt the term Embedded Implicatures as the name for a phenomenon without any commitment to an analysis of the phenomenon as an implicature. Examples of such embedded implicatures have been discussed in a number of publications, which have also used the terms local, intrusive, or truth conditional implicatures, as well as explicature and metalinguistic negation (specifically for not) for the same phenomenon (Cohen 1971, Horn 1985, Sperber & Wilson 1986, Carston 1988, Recanati 2003, Levinson 2000, Chierchia 2002). (3) and (4) are two examples of such embedded implicatures.

(3) They didn't play many of Beethoven's symphonies. They played all of them.

(4) Anyone who saw Elvis or Bobby Fischer must be blind. But those who saw both of them must have good eyes.

In both examples, the sequence of the two sentences is contradictory if many and or in the first sentence are interpreted literally. However, a coherent construal is possible, and this reading illustrates the phenomenon of an embedded implicature. This interpretation is made available by putting special intonational emphasis on many and or respectively. The first sentence of (3) could then be paraphrased as They didn't play many and not all of Beethoven's symphonies. And similarly, the first sentence of (4) could be paraphrase as Anyone who saw Elvis or Bobby Fischer, but not both, must be blind. Both (3) and (4) would be assigned the correct interpretation if the implicatures associated with many and or were actually part of the lexical meaning of these words: many would mean many, but not all and or would mean ... or ..., but not both. In these examples, it seems therefore possible to add the information an implicature would provide to the truth conditions of the sentence at some point and be subsequently negate these implicatures.

While both (3) and (4) contain a downward entailing environment, the phenomenon of an Embedded Implicature has been claimed to occur also in non-downward entailing environments (Recanati 2003, Levinson 2000, Chierchia 2002). Consider the examples in (5) where the scalar item occurs in the scope of an upward entailing operator. The global account as presented above (cf. van Rooij & Schulz 2004 and Section 1.2 below) predicts that (5) should be felicitous even if the speaker knows that most musicians know all of Beethoven's symphonies, since it would still be false that every musician knows all of Beethoven's symphonies in such a situation. Similarly, (6) should be felicitous if most people saw both Elvis and Bobby Fischer.

(5) Every musician knows many of Beethoven's symphonies.

(6) Everyone saw Elvis or Bobby Fischer.

The prediction of the local approach, however, would be stronger. If implicature computation took place in the scope of the universal, this would predict a stronger interpretation of (5) and (6). Namely, (5) should only be true if every musician knows many, but not all of Beethoven's symphonies. Similarly, (6) should require that everyone saw exactly one of Elvis and Bobby Fischer. Unfortunately, though, it is difficult for me to decide which of these empirical claims is correct. I believe it is fairly clear that the strong, local interpretation cannot be the only one, for examples like (7) are consistent and do not seem to involve cancellation of an implicature.[1]

(7) Everyone saw Elvis or Bobby Fischer, and certainly many saw both.

Since the weaker, global implicature is always available, it is then hard to discern whether the stronger, embedded implicature is sometimes also available or not. Furthermore, other factors (like an assumption that every relevant musician has the same

[1] I argue below that implicature cancellation is much more restricted that previously assumed. My proposal there entails that (7) cannot involve implicature cancellation. For now, just not that a continuation with and certainly cannot be used to license cancellation of the exclusivity implicature of disjunction in (i).

(i) #John saw Elvis or Bobby Fischer, and certainly both.

amount of knowledge) might give rise to a stronger interpretation than the global implicature predicts. Therefore, while I assume that the strong, embedded implicature is optionally available, I am not prepared to argue for it empirically. From a theoretical perspective this assumption seems more elegant, most mechanisms that have been proposed to account for the embedded implicatures in (3) and (4) predict that embedded implicatures should also be available in (5) and (6). However, the proposed metalinguistic negation of Horn (1985) would tie the presence of embbedded implicature to the presence of overt negation, and therefore would not be applicable to (5) and (6). In the following, I focus on embedded implicatures in downward entailing environments as in (3) and (4).

If we accept that the global implicatures in (1) and (2) are due to the same mechanism as the embedded implicatures in (6) and (7), which should be our default position, the existence of embedded implicatures is a strong argument for the local view of implicature computation. In this paper, I address the question whether we can indeed assume that the embedded implicatures implicatures as in (6) and (7) are results of the same mechanism as the global implicatures in (1) and (2). To address this question I present in the first section two current versions of the global and local view of implicatures in more detail. In the second section, I discuss three questions where the hypothesis that embedded implicatures and global implicatures are due to the same mechanism can be empirically tested: Do implicatures obligatorily arise at a certain of implicature composition? Do embedded implicatures like global ones exhibit a modal step (which I discuss in the next section)? And, does a process like implicature computation also apply to presuppositions globally and in embedded position?

1 Two Theories

1.1 The Global Account

Grice's account of quantity implicatures has been gradually improved---or, at least, spelled out in more detail---by a number of people (Horn 1972, Gazdar 1979, Horn 1989, and others). In the following, I assume the version of the global account I myself

proposed in a recent paper (Sauerland 2004), which incorporates many important insights of the earlier works. I briefly summarize the aspects of this proposal that play a role for the present discussion.

Following Horn (1972), I assume that scalar items invoke sets of alternatives (see also Hirschberg 1991[1985], Matsumoto 1995). For example, (8) would be the set of scalar alternatives invoked by many.

(8) {many, all}

The scalar alternatives determine which alternative sentences are considered for the satisfaction of the quantity maxim. Namely, only those alternatives result in implicatures that are derived by replacing scalar items with an alternative of theirs.

The maxim of quantitity furthermore requires a comparison of informativity. Horn (1972) and others assume that the scalar alternatives themselves are ordered by informativity into scales. I, however, assume that the comparison applies at the sentence level. This assumption predicts that, when a scalar item is embedded in a downward entailing environment, the implicatures are reversed as illustrated by (9), where (9a) is less informative than (9b) and therefore (9a) implicates that many of Beethoven's symphonies were played (Atlas & Levinson 1981).

(9) a. They didn't play all of Beethoven's symphonies.
b. They didn't play many of Beethoven's symphonies.

One further important assumption of the version of the global account I assume is that implicatures come at two levels of epistemic strength (cf. Soames 1982, Horn 1989): Primary implicatures state that the speaker is not certain that some proposition P holds. Secondary implicatures, on the other hand, state that the speaker is certain that P does not hold. Secondary implicatures are strictly stronger than primary ones since being certain that P does not hold entail being not certain that P holds.

Consider (10) (repeated from (1)) for an illustration.

(10) They played many of Beethoven's symphonies.

From Grice's first maxim of quantity and the maxim of truth the following requirement for cooperative speakers follows: make the most informative statement that you believe to be true. But this requirement only entails the primary implicature (11):

(11) $\rightsquigarrow$ The speaker isn't certain whether they played all of Beethoven's symphonies.

The secondary implicature in (12) only follows from Grice's maxims together with an additional assumption which must entail that either P is certain or not P is certain, where P is the proposition that they played all of Beethoven's symphonies.

(12) $\rightsquigarrow$ The speaker is certain that they did not play all of Beethoven's symphonies.

Secondary implicatures are those actually observed in most cases while the primary implicatures cannot be detected independently, because they are entailed by the secondary implicatures. The step of reasoning leading from primary to secondary implicatures resembles the step of reasoning triggered by neg-raising verbs like believe, where it is well known that (13a) is understood to entail (13b) (Horn 1978).

(13) a. John doesn't believe that they played well.
b. John believes that that they didn't play well.

A third important assumption of the global account I assume concerns the scale of disjunction. Namely, I assume the scale in (14), where not only the conjunction but also the individual disjuncts are alternatives of a disjunction (Lee 1995):

(14) {A or B, A, B, A and B}

This assumption interacts with the epistemic step of implicature computation in an interesting way in my system. Consider example (15) (repeated from (2)).

(15) I saw Elvis or Bobby Fischer at the airport.

The primary implicatures of (15) are (16a), (16b), and (16c). In conjunction with the asseration, the primary implicatures entail furthermore (16d) and (16e), which state that each disjunct must be possible.

(16) a. $\rightsquigarrow$ I'm not certain that I saw Elvis.
b. $\rightsquigarrow$ I'm not certain that I saw Fischer.
c. $\rightsquigarrow$ I'm not certain that I saw Elvis and Fischer.
d. $\rightarrow$ It's possible that I saw Elvis.
e. $\rightarrow$ It's possible that I saw Fischer.

In this case, only the secondary implicature in (17) arises from the primary implicatures because the secondary implicatures that could arise from (16a) or (16b) contradict the primary implicatures. For example, (16a)'s secondary implicature would be that I'm certain that I didn't see Elvis, but this contradicts (16d), and therefore is blocked.

(17) $\rightsquigarrow$ I'm certain that I didn't see Elvis and Fischer.

This concludes the presentation of the global account as I will assume it. The most important aspect for the following is the epistemic distinction between primary and secondary implicatures, and the use of this distinction in the account of the implicatures of disjunction. The two entailments (16d) and (16e) of the primary implicatures have been called the generalized conventional implicatures of disjunction by Gazdar (1979). On my analysis, these are conversational implicatures and follow from the maxim of quantity. The case of disjunction is interesting because here primary and secondary implicatures diverge, and therefore the primary implicatures can actually be observed.[2] This motivates the distinction between the two, and will serve below as a way to study the behaviour of primary implicatures.

[2]Note that disjunction in the in the scope of a universal quantifier is predicted to have further secondary implicatures because in this case the secondary implicatures from the individual disjuncts do not contradict the primary implicatures (D. Fox, p.c.). For example (i), the two further secondary implicatures are given in (iia) and (iib). These secondary implicatures together with the assertion entail (iic) and (iid), which seem to be actually observed.

1.2 The Local Account

As already mentioned, a number of people have criticized Grice's account on the basis of examples like (3) and (4), and developed various versions of an local account of scalar implicatures, where implicatures are computed for constituents smaller than the whole utterance and that these implicatures strengthen the interpretation of that constituent. Various versions of the local account have been proposed from relevance theory where embedded implicatures are represented by additional syntactic material added to LF-structures (Sperber & Wilson 1986, Recanati 2003) to Levinson's proposal that embedded implicatures are essentially added to the lexical entries of scalar items. I follow Krifka (1995), Fox (2003), King & Stanley (2004) to assume that the points at which embedded implicatures are computed are marked by an implicature computation operator that is projected in the syntax.[3] I represent this operator as ONLY, and assume that its semantics are very similar to that of only though it lacks overt morphology. The important question from my perspective is how much alike to the process of implicature computation at the utterance level this operator underlying embedded implicatures.

For example, I assume that the embedded implicature in (18) (repeated from (3)) is due to the representation below, where the silent ONLY occurs in an position below negation.[4]

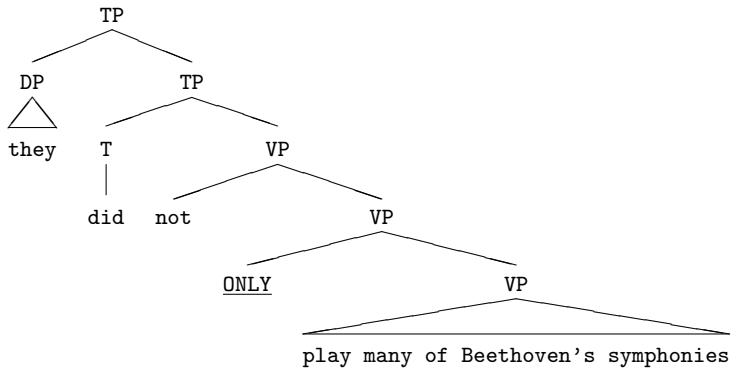
(18) They didn't play many of Beethoven's symphonies.

(i) Every boy is (either) playing football or badminton.

(ii) a. $\rightsquigarrow$ I'm certain that not every boy is playing football.
b. $\rightsquigarrow$ I'm certain that not every boy is playing badminton.
c. $\rightarrow$ I'm certain that some boy is playing badminton.
d. $\rightarrow$ I'm certain that some boy is playing football.

[3] King & Stanley (2004) would probably object to calling this operator an implicature computation operator. On their view, the operator is a silent only and is not related to implicatures. I am, however, understanding the local account broadly to include any account that assumes an operation that resembles implicature computation and applies to parts of the sentence. In fact, I would even consider a version of the metalinguistic-negation approach Horn (1985) that assumes a silent operator with the semantics of quotation a local account.

[4] Example (18) must also allow other structures where silent ONLY either does not occur at all, or it occurs only in a position above negation. These structures, however, do not receive the embedded implicature interpretation.



For the precise semantics of silent ONLY, two candidates have been discussed in the literature (the proposal of Spector (2003) is an interesting compromise between the two positions). The proposal of Rooth (1985) for overt only, I refer to as the linguistic account. It makes use of Rooth's notion of focus alternatives and states that all focus alternative that are logically independent from the complement of only are false:[5]

(19) $[\![\underline{\text{only}}\ \text{S}]\!]^{\text{w}} = [\![S]\!]^w = 1 \wedge \forall \text{S}' \in [\![\text{S}]\!]_f : [\![\text{S}']\!]^w = 0 \vee [\![\text{S}]\!] \rightarrow [\![\text{S}']\!]$

The other proposal I am aware of is due to Groenendijk & Stokhof (1984), and I will call it the modeltheoretic account (see van Rooij & Schulz 2003, Kratzer 2003 for recent related proposals). The intuition is that the actual situation is in some sense a minimal situation making the complement of only true. Groenendijk & Stokhof (1984) focus on the case of where only associates with an upward-entailing generalized quantifier (viewed as a property of sets) where the intuition can be spelled out as in (20):

(20) $[\![\underline{\text{only}}]\!]^w(Q^{(et)t})(P^{et})$ = 1 iff. $Q(P) = 1 \wedge \forall P' \subset P : Q(P') = 0 \vee P = P'$

Initially, (20) can be applied in far fewer cases than (19) since (20) can only apply to upward entailing quantifiers. But a number of extensions have been proposed. To overcome the limitation to upward-entailing quantifiers Stechow & Zimmermann (1984) propose to introduce a second exhaustification operator. van Rooij & Schulz (2003) introduce a generalization of (20) that covers expressions other than quantifiers. For the following discussion, however, (20) is largely sufficient.

[5] Here, $[\![\text{S}]\!]_f$ is the set of focus alternatives of S, i.e. sentences derived by replacing the focussed phrases with alternative phrases.

The main semantic contribution of only consists, on both approaches, of negating certain alternatives. The main difference between the two lexical entries is how the alternatives are represented. On the linguistic approach, the alternatives are phrases. The model-theoretic approach is stated in (20) to consider alternative scenarios (or rather the extensions of the scope of the quantifier these would give rise to), and to demand that the actual scenario represented by P be minimal. However, (20) can be equivalently restated as (21), where the alternatives considered are quantifiers that differ from the quantifier only is associated with for the actual situation or a smaller situation:

(21) $[\![\underline{\text{only}}]\!]^w(Q^{(et)t})(P^{et})$ = 1 iff.
$Q(P) = 1 \wedge \forall Q' : (\exists P' : P' \subseteq P \wedge Q(P') = 1 \wedge Q'(P') = 0) \rightarrow Q'(P) = 0$

The comparison between (19) and (21) makes it explicit that the main issue in deciding between the two possible lexical entries for only is the nature of the alternatives: on the linguistic definition we expect to find constraints on possible linguistic forms reflected in the set of alternatives considered, while on the model-theoretic definition such constraints should be absent.

Van Rooij & Schulz (2004) approach the issue of distinguishing between the two approaches to only by considering examples like (22).

(22) Every student took Semantics 1 or Phonology 1 and 2. (van Rooij & Schulz 2004, (9))

Van Rooij and Schulz cite the intuition that (22) implicates, at least on one reading, that no student took all three courses (Chierchia 2002 has a similar judgment). They consider a generalization of the model-theoretic approach which entails this judgment. While I cannot present the full account here, consider the lexical entry for only in (23). The lexical entry in (23) predicts that (22) entails that no student took all three courses, Semantics 1 and Phonology 1 and 2.

(23) $[\![\underline{\text{only}}]\!]^w(Q)(\vee)(P, R)$ = 1 iff.

$$Q(P \cup R) = 1 \wedge \forall P' \subset P, R' \subset R : Q(P' \cup R') = 0 \vee (P = P' \wedge R = R')$$

Intuitively, (23) is a generalization of (20) because it demands that both properties P and R be minimal. van Rooij & Schulz (2004) develop a theory the captures this intuitive similarity, which I however cannot present in this paper.

Does this account of (22) amount to an argument for the model-theoretic approach? I believe the issue is more subtle than van Rooij & Schulz (2004) make it out to be for the following reason (cf. Spector 2003): If the proposition in (24) was one of the alternatives considered on the linguistic approach, it would also follow that (22) entails that no student took all three courses.

(24) Every student took Semantics 1 or Phonology 1 and 2 and one student took all three, Semantics 1 and Phonology 1 and 2.

Since (24) might well be considered as an alternatives under the special circumstance where the interpretation of (22) excluded any student taking all three courses, example (22) does not actually distinguish between the two account of only. In this paper, I adopt the linguistic proposal for the following reason: The modeltheoretic proposal does not seem to be equally promising as a starting point because examples like (25a) and (27a) suggest that linguistic form matters for the determination of the set of alternatives. Consider first (25a), assuming that only associates with many (the point here carries over to (1) which must contain silent ONLY by the hypothesis currently under consideration). (25a) entails (25b), but not (25c).

(25) a. They only played many of Beethoven's symphonies.
b. $\rightarrow$ They didn't play all nine.
c. $\not\rightarrow$ They didn't play five.

Both the linguistic account and the model-theoretic account of only seem to predict out-of-the-box that (26a) entails (26c) if we assume that many can be satisfied by a plurality of four or more. On the linguistic account, this entailment arises if we consider the alternative determiner five or more, while on the model-theoretic account it

follows from the lexical entry of only in (20). The same point can be made with (26), which is predicted by either analysis of only to entail (26c), if most is equivalent to more than half.

(26) a. Only $[\text{most}]_F$ boys left.
b. $\rightarrow$ Not all boys left.
c. $\not\rightarrow$ Less than 51% of the boys left.

However, it seems fairly easy to rule out the problematic entailments (25c) and (26c) on the linguistic account of only because here we have actual access to the alternative sentences under consideration. For example, we could stipulate here that a alternatives considered must all be of a morphological, syntactic, or semantic type similar to the expression in focus. On the model-theoretic alternative, however, it seems to be harder to stipulate such a condition. Quite possibly these issues can be resolved while maintaining the purely model-theoretic account of only, but the linguistic account seems to me to provide a more promising starting point. Hence, I assume Rooth's linguistic account in the following.

1.3 Section Summary and Outlook

The global and the local account I consider, therefore, share two features. For one, both accounts make use of alternative semantics. The global account applies it to scalar terms directly, while the local account applies it to focussed terms: But, since the local account assumes that scalar terms are focussed whenever implicatures are observed, the two accounts in effect share the use of alternative semantics. Secondly, both accounts negate the truth of stronger alternative sentences. The local account based on only actually negates the truth of all sentences not entailed by the assertion, but this specifically entails the negation of all stronger alternatives.

Because of these commonalities of the analyses, the proposal that both analyses are needed to explain the phenomenon of implicatures does not look attractive. It seems to be the case that if we assume that local implicature computation via silent only applies at the root node, this would capture the phenomenon of global implicatures.

Nevertheless, I (as do, King & Stanley 2004) hesitate to make this step of equating the mechanism giving rise to the implicatures in (1) and (2) with the mechanism at work in (3) and (4). In the following section, I outline three classes of phenomena that point to a difference between the embedded and global implicatures. The class of phenomena discussed in the next section point towards the conclusion that embedded implicatures are almost always optional, while global ones are not. Then I consider the question of whether embedded implicatures have an epistemic, and conclude that therein might lie another difference between embedded and global implicatures. Finally, I discuss whether local implicature computation like global computation applies to presuppositons. Since I conclude that this is not the case, this represents another argument for separate accounts of global and embedded implicatures.

2 Evidence for Non-Uniformity

A uniform account of the phenomena I labelled global implicatures and embedded implicatures would prima facie predict that they should share all their properties. The fact that they seem to share to share two properties, alternative semantics and the negation of stronger alternatives, provides motivation to pursue such a uniform account. In this section, however, I consider other properties of the two phenomena which they would also be predicted to share. While my considerations will be inconclusive, my preliminary observations indicate that differences seem to exist with respect to the properties I investigate, and therefore, these results at least cast doubt on the claim that the two phenomena, global implicatures and embedded implicatures, are the same.

The questions I look at in the following three sections are the following: 1) Whether embedded and/or global implicatures must be obligatorily computed and whether implicature computation must apply to all scalar terms at the same point; 2) whether epistemically weak, primary implicatures occur at the places where embedded implicatures arise; and 3) whether an operation similar to implicature computation also applies to presuppositions. The tentative conclusion I reach at the end of this section is that for all three questions have to be answered differently for global and for embedded implicatures.

2.1 Optionality and Selectivity

The first question, here, is whether embedded implicatures are obligatory. The answer is, I believe, that this is clearly not the case. Consider again (27) (from (3)) and (28) (from (4)), which are examples of embedded implicatures:

(27) They didn't play many of Beethoven's symphonies. They played all of them.

(28) Anyone who saw Elvis or Bobby Fischer must be blind. But those who saw both of them must have good eyes.

While in these examples (and with the appropriate intonation) embedded implicatures seems to be obligatory, the same structures in a different context, do not support embedded implicatures are absent.

(29) They didn't play many of Beethoven's symphonies. Only the third and the ninth.

(30) Anyone who saw Elvis or Bobby Fischer can get in for free.

These facts are interesting to consider because they argue against accounts like that of Levinson (2000) where embedded implicatures are generally obligatory. I believe they also cast into doubt the proposal of Chierchia (2002): On this proposal embedded implicatures are also computed obligatorily, and then are obligatorily cancelled in case a scalar term occurrs in the scope of a downward entailing operator. Therefore, it can only account for (29) and (30), but not for (27) and (28). However, the local account in the previous section can account for the facts in (29) and (30) by assuming that silent ONLY is not obligatorily present.

Global implicatures seem to differ from embedded ones with respect to the property of obligatoriness, though the full picture is more difficult than this. Consider first the sequence in (31). I perceive (31) to be odd out of the blue, though there are certainly contexts where it would be acceptable. I assume the oddness of (31) out of the blue to be due to the fact that the primary implicatures of the first sentence---that John

possibly didn't see Fischer and possibly didn't see Elvis---contradict the second sentence.

(31) #John saw Fischer or Elvis. He definitely saw Fischer.

In general, it seems odd to cancel a primary implicature. (32a) is a second example of this type where the primary implicature that it is possible that did not play all of Beethoven's symphonies should be cancelled. In (32b), on the other hand, the secondary implicature that it is certain that they did not play all Beethoven's symphonies is cancelled.

(32) a. #They played many of Beethoven's symphonies, and definitely all.
b. They played many of Beethoven's symphonies, and possibly all.

Chungmin Lee (personal communication) reminds me that with in fact it seems possible to cancel primary implicatures as, for example, Horn (1972) has shown extensively.

(33) a. John saw Fischer or Elvis. In fact, he saw Fischer/Elvis/both.
b. They played many of Beethoven's symphonies. In fact, they played all of them.

Other expressions that allow this implicature cancellation are indeed and what's more. Note though that it is possible to insert no in front of in fact in these examples. This indicates that the second clause in (33) is really a correction, contradicting the first clause. In fact can be used to correct a wrong assertion in the dialog in (34).

(34) A: John didn't talk to Mary.
B: You're wrong. In fact, he did talk to her.

In sum then, to cancel a secondary implicature the simple assertion of the opposite with possibly ... is sufficient, but to cancel a primary implicature assertion of the opposite alone is not sufficient. I assume that primary implicatures cannot be cancelled as the data with definitely (and similar facts hold with certainly and I'm certain) show. The

data with in fact and similar expressions, I assume, show that cancellation of secondary implicature requires something beyond assertion of the opposite. The difference between the date with definitely and the data with in fact I leave for future research.[6]

If these results are on the right track, a difference exists between embedded implicatures and global implicatures of the primary type. On a theory, where the two types of implicatures can be due to two different sources, this difference follows easily. Within a theory that relies only on a syntactically projected implicature computation operator, it is more difficult to capture this difference between global and embedded implicatures. One plausible way to capture the difference would be state that this operator is optional in embedded positions, but must occur at the root. However, this would not actually account for the difference because silent ONLY does not need to associate with all foci in its scope, as I show now.

Consider example (35). In this case, the exclusivity implicature of or is negated, and therefore must be computed as an embedded implicature. On the approach I am considering, this entails that a silent ONLY is projected below negation in the first sentence of (35).

(35) They didn't invite many friends or many relatives: They invited many friends and many relatives.

But, the scalar item many also occurs twice in the scope of this silent ONLY. Nevertheless the implicatures of many---that they did not invite all friends and that they did not invite all relatives---are not negated, and therefore must not be computed locally at the point where silent ONLY is projected. The observation in (35) is not

[6]There is one class of contexts where primary implicatures do not seem to be obligatory, namely when the scalar term occurs as a part of destressed material (cf. Hirschberg 1991[1985], van Rooij & Schulz 2004) as in the question-answer pair (i). I do not think this affects the point I am making here, though I cannot give a full account of the phenomenon. The account of van Rooij & Schulz (2004) seems to be compatible with the line I am taking in the text. Another possibility that I actually find more promising would be that licensing of destressing as analyzed by Schwarzschild (1999) blocks implicatures (see Section 3 below).

(i) a. Who saw Fischer or Elvis?

b. John saw Fischer or Elvis. He definitely saw Fischer.

surprising, but just shows that silent ONLY just like overt only is selective with respect to which focussed items it associates with. In the literature on overt only, this property is discussed in connection with multiple association to focus (Krifka 1992, Wold 1996, Beaver & Clark 2003), and the account offered in this literature for overt only carry over to silent ONLY straightforwardly. The important point for my argument is, however, the fact that ONLY is selective about which scalar items it associates with entails that the account of the obligatoriness of global implicatures suggested above does not go through: The suggestion was to stipulate that root clauses need to be initiated by silent ONLY. But, this would not predict global implicatures to be obligatory because ONLY need not associate with all scalar items in its scope. Therefore, the obligatoriness of global implicatures argues that global implicatures and embedded implicatures are not always due to the same mechanism.

2.2 Epistemic Step

A second difference between global and embedded implicatures seems to exist with respect to the epistemic step: Recall the account of of (36)(= (2) that I offered above.

(36) I saw Elvis or Bobby Fischer at the airport.

My analysis predicts that the two sentences in (37) are primary conversational implicatures of (36).

(37) a. I don't know whether I saw Elvis.
b. I don't know whether I saw Fischer.

Recall furthermore that (36) also is predicted to have just one secondary implicature; namely the exclusivity implicature that I didn't see both Elvis and Bobby Fischer.

For the following, I use the example (38) rather than (36), but of course the account I offered for (36) generalizes. Applied to (36), it predicts as primary implicatures that the speaker neither doesn't know for sure that John worked, nor that Mary worked, and as secondary implicature that the speaker is certain that not both John and Mary worked.

(38) John or Mary worked.

In (39), an embedded exclusivity implicature is in my judgment available with heavy focus on or.

(39) When John or Mary worked, the result was good, but when John and Mary worked, the result was a mess.

Compare (39) with (40), which is an attempt to create an embedded primary implicature. The interpretation in question would be: When the speaker is sure that John or Mary worked and not sure that John worked, the result was good, but when the speaker is sure that John worked, the result was a mess. A scenario that should bring out this interpretation is the following: John and Mary are the only two employees at a little café. Their work schedule is very flexible, and the only regularity is that Mary never works on a Tuesday because she is visiting her mother. Furthermore, every Tuesday evening the café is a mess while, on every other day, it is impeccably clean at the end of the day.

(40) #When John or Mary worked, the result was good, but when John worked, the result was a mess.

In my judgement, (40) is odd in this scenario and I take this to indicate that primary implicatures cannot be embedded. If this judgement and the conclusion I draw from it turned out to be more widely shared, this would constitute another difference between global and embedded implicatures. It would seem difficult to explain this difference under an account of the two kinds of implicatures that makes use of the same implicature computation operator for both of them, and therefore this chain of argumentation would, as far as I can seen, result in a second argument for two different accounts for global and for embedded implicatures.

2.3 Implicated Presuppositions

A third property where global and embedded implicatures seem to differ is whether implicature computation also applies to presuppositions. The observation that the global computation of implicatures must also in some way apply to presuppositions is due to Heim (1991). She makes the argument in passing while the main focus of her article is the analysis of the definite and indefinite determiner. Furthermore, Heim's idea has not received much attention in the subsequent literature, possibly also because he paper was published in German. Recently, however, Schlenker (2003) and myself (Sauerland 2002, 2003) have argued that Heim's idea can be applied in other areas. This work has therefore corroborated Heim's proposal that there is a general maxim Maximize Presupposition that has the same effect as Grice's Quantity maxim, but applies not to the informative assertion but to the presupposition of a clause.

The example where Heim applies this maxim is the indefinite determiner a of English. Her argument is based on the anti-uniqueness effect observed, for example, in (41). The example is odd since we know that the victim must have had a unique father.

(41) #They interviewed a father of the victim.

While Hawkins (1986) proposes to derive anti-uniqueness as an Gricean implicature which compares the indefinite example with the alternative containing a definite article, Heim (1991) points out that the notion of implicature does not actually apply to this comparison because the two alternative only differ with respect to their presuppositions if we assume the Fregean analysis of the definite determiner: Since presuppositions are by nature not informative, but repeat information that is already known, Grice's maxim of quantity which compares the informativity of alternatives is inapplicable. Therefore, Heim proposes that there is second maxim, Maximize Presupposition, that demands that a cooperative speaker use the one of two scalar alternatives with more or stronger presuppositions whenever the speaker is certain that these presuppositions are satisfied. If the is a scalar alternative to a, it follows that (41) could only be used if the speaker believes that it is possible that the victim does not have a unique father. Since this would contradict our world-knowledge, (41) is correctly predicted to be odd by

Heim's account.

Heim points out that her analysis predicts only the presupposition that the speaker be not sure that the presupposition of the. This corresponds to a primary implicature in my discussion of implicatures. Heim makes it plausible that, unlike the case of implicatures, the result of maximize presupposition always is just epistemically weak in this sense. For example, (42) would only lead us to conclude that the speaker believes that it is possible that there be a 3 ft. long trout other than the one John caught is, and not that the speaker have certain knowledge of other 3 ft. long trouts.

(42) John caught a 3 ft. long trout. (Heim 1991)

In general, then we can state that maximize presupposition has the following consequence: If a scalar alternative S′ of S is also true and S′ has more or stronger inherent presuppositions, S presupposes that speaker believes that it is possible that the presuppositions of S′ are not satisfied. I will call any presupposition derived from the maximize presupposition maxim, an Implicated Presupposition in the following. Using this terminology, an indefinite phrase a P introduces an implicated presupposition that the speaker is not sure that there is a unique P.

Other examples of implicated presuppositions are the following four: The plural as argued in (Sauerland 2003, Sauerland et al. 2004) triggers an implicated presupposition that the speaker is not sure that there is a unique referent.

(43) a. How are your children$_{[plur]}$?
b. implicated presupposition: You might have more than one child.

Similarly, third person introduces an implicated presupposition that speaker is not sure that the referent is the speaker (Sauerland 2003, Schlenker 2003):

(44) a. He$_{[3]}$ is singing.
b. implicated presupposition: He might not be the speaker.

Furthermore, the non-pastness requirement of the present tense should be analyzed as an implicated presupposition (Sauerland 2002):

(45) a. John fasts$_{[\text{present}]}$.
b. implicated presupposition: The relevant time interval is not entirely in the past.

A case of an implicated presupposition not triggered by just a feature, but by two competing full lexical items is that of non-factive verbs when a factive alternative exists. Consider (46):

(46) a. John believes that Mary is smart.
b. implicated presupposition: It's possible that Mary isn't smart.

Finally, Schlenker (2004) uses the maximize presupposition maxim to account for the French subjunctive.

One important argument for the analysis of these presuppositions as implicated presupposition is that they project differently from the scope of a universal. Consider (47) with an indefinite in the scope of a universal quantifier.

(47) Every boy who has one or more sisters should call a sister of his.

The presupposition that would be predicted if a had inherently a presupposition that the speaker be not sure about the uniqueness could be paraphrased as (48a), in case it is established that the speaker knows exactly which boy has how many sisters. However, the weaker presupposition in (48b) actually corresponds to my intuitions.

(48) a. Every relevant boy has more than one sister.
b. Not every relevant boy has exactly one sister.

The account of anti-uniqueness as an implicated presupposition precisely predicts (48b) in this case: It predicts that the speaker be not sure that the presupposition of the

definite article be satisfied. But, the definite article would lead to a presupposition that every relevant boy have exactly one sister. (48b) is the negation of that and therefore predicted as the implicated presupposition of (47).

This argument carries over to the other cases mentioned above. Consider the examples in (49) through (52)

(49) a. Every boy should call [his sisters]$_{[plur]}$
b. Not every boy has only one sister.

(50) a. Everyone of us should admit his$_{[3]}$ errors.
b. Not everyone of us is the speaker.

(51) a. Every Monday, John fasts$_{[present]}$
b. Not every relevant Monday is past.

(52) a. John necessarily believes that Mary is smart.
b. It's not necessarily the case that Mary is smart.

These examples already show, that implicated presuppositions need not necessarily be computed as locally as possible, because in all these the cases the computation of the implicated presupposition must take place outside the scope of the universal quantifier.

Now, consider the further question whether implicated presuppositions can ever be embedded. I am at present not entirely sure what is the best way of investigating this questions. One possible piece of evidence comes from considering presupposition accommodation (Heim 1992). Presupposition accommodation can add a presupposition to the restrictor of a quantifier. For example, presupposition accomodation might restrict the universal quantifier in (53) to countries that have a king, thereby satisfying the existence presupposition of the definite.

(53) Every European country cherishes its king. (Heim 1992)

What would local computation of an implicated presupposition followed by presupposition predict for the examples (49) to (51). To simplify the predicted presuppositions assume again that the speaker knows for sure the number of sisters of each boy in (49) and also has certain relevant knowledge for the other examples, so that the epistemic status of the implicated presupposition need not be represented.

(54) a. Every boy who has more than one sister should bring his sisters.
b. Everyone of us who is different from the speaker should admit his errors.
c. Every non-past Monday, John fasts.

In my judgement, interpretation (54b) is clearly not available. The other interpretations I am less certain about. But, if (49) was adopted as a rule, I would be inclined to assume that a boy with only one sister would also be required to invite her,. Furthermore, I would find (51) slightly odd in case John has not fasted on any past Monday. Therefore, I tentatively conclude that implicated presuppositions cannot be embedded.

If this generalization is correct it shows that there is a process that is at least very similar to implicature computation, namely the process leading to implicated presuppositions which only applies at the root. Then we may ask the question whether, instead of attempting to unify global and embedded implicatures, global implicatures and implicated presuppositions should be derived from the same source.

3 Conclusion

The phenomenon of embedded implicatures is important for the understanding of the mechanisms underlying implicatures because it shares a number of properties with standard examples of global implicatures. The approach I have taken in this paper is to try to compare embedded implicatures with implicatures and related phenomena as they arise at the utterance level globally. The three questions I looked at were: Are implicatures optional or obligatory at the embedded and at the utterance level? Are epistemically weak, primary implicatures drawn at the embedded and at the utterance level? Does a

process like implicature computation apply to presuppositions at the embedded and at the utterance level? The conclusion I reach in this paper is that embedded implicatures differ from implicatures at the utterance level with respect to all three points. At this point, my conclusions are based on the empirical evidence I could come up with and based almost solely on my own judgements. If my conclusions are correct, they support the view of King & Stanley (2004) that the phenomenon of embedded implicatures is actually not due to the same operation as implicatures at the utterance level.

There are other properties one might look at for the comparison of embedded implicatures with implicatures at the utterance level. Chungmin Lee (p.c.) reminded me that the global and local approach as I outline in section 1 differ in two ways that I already mentioned in passing when I introduced the accounts: On the one hand, the local approach makes implicature computation focus-sensitive, but not necessarily dependent on scales since it assumes a silent counterpart of only as the implicature computing operator. The global approach, on the other hand, builts in a dependency on scales at least in the form of providing a scalar set of alternatives via the lexicon, but does not depend on focus. Unfortunately I can only offer some brief and preliminary comments about why I had difficulties connecting any empirical issues to these two differences.

First consider the question whether implicature computation involves scales in determining what alternatives are excluded. I understand Horn (1972) notion of a scale to refer to totally ordered sets of lexical items of the same semantic type where the order corresponds to logical entailment after existential closure has applied to all open argument positions of the items on the scale. Note that neither approach in the form that I consider makes use of scales in the sense of Horn: The local approach relies on the set of all focus alternatives of an expression. The global approach makes a smaller departure: It assumes that scales are unordered sets of lexical items. On the global approach, the effect of ordering is introduced by the comparison of the alternative at the sentence level.

However, there remains still a small difference between the two accounts: It is generally accepted that the focus-alternatives must included propositions that neither entail nor are entailed by the asserted proposition. For example, the licensing of the focus on Bach in (55) according to Rooth (1985) invokes the focus alternative Beethoven.

(55) He played Beethoven and he played $[\text{Bach}]_F$.

In the global account I assume (Sauerland 2004), on the other hand, the scalar alternatives of any assertion that are considered all stand in an entailment relation to the assertion: either the assertion entails the scalar alternative or vice versa. This property, as the account stands, just follows from the lexical scales stipulated, but it is a property of the account, and this property might be useful in understanding how scales arise. Note that, I do not assume that all scalar alternatives are totally ordered by entailment because, at least for the set of scalar alternatives of a disjunction, this is not the case. Therefore, the property under discussion that distinguishes the set of scalar alternatives from the focus alternatives can only be captured by the notion of scalarity of a set relative to an asserted proposition in (56) (cf. Matsumoto 1995 for a different condition on scalar alternatives). Condition (56) could be added to the lexical entry of ONLY as a presupposition if this was found to have desirable consequences for the account.

(56) A set S of propositions is scalar relative to p if and only if, for all $q \in S$, $p \rightarrow q$ or $p \rightarrow q$ holds.

But, first consider the following question: What are the empirical consequences if the set of alternatives of a assertion p must be scalar relative to p in the sense of (56)? This question actually turns out to be difficult to answer. Consider first (57). At least in answer to a question about what they played, (57) implicates that no piece by Bach was played by him.

(57) He played Beethoven.

But, example (57) does not show that the set of alternative can be non-scalar. The implicature that they did not play Bach need not be derived from the alternative He played Bach, but could also be derived from the alternative He played Beethoven and Bach. Namely, the negation of the latter alternative in conjuction with the assertion (57) entails that he did not play Bach. Since the latter

alternative entails (57), the abstract scalarity requirement in (57) does not make any difference in this case, though it does matter of course what the actual scaler are in this case. Hence I am presently not sure whether the scalarity property makes any empirical predictions.[7]

The second basic difference between the two accounts I am considering concerns the role of intonation. While silent ONLY on the local account associates with focus, implicature computation on the global account associates with scalar items regardless of whether they are focussed. As I noted in footnote (i) above the fact that destressed scalar items sometimes do not seem to introduce implicatures (Hirschberg 1985) does not really argue in favor of the local account despite initial appearance. Namely, if we assume that destressing is licensed by an operator that has the semantics of Givenness in the sense of Schwarzschild (1999), the givenness operator blocks implicature computation in its scope given suitable assumptions about the interaction of presupposition and implicature computation: Assume that the givenness-operator[8] presupposes that the proposition in its scope be entailed by some other proposition p that is the antecedent of the destressed material. Then the presupposition of the givenness operator is not satisfied for all scalar alternatives of the utterance where the material in the scope of the givenness operator is not entailed by p. Therefore the global account also entails that destressed material generally lacks implicatures, and therefore one potential argument for the extension of the local account to implicatures at the utterance level does not go through.[9]

[7] Lee (2004) considers the implicatures of verbs to argue for a scalarity requirement (possibly, though, not exactly the one in (56)). Specifically he considers the example in (i) in answer to the question Did he go on the stage?.

(i) He arrived.

In this case, I share the intuition that (i) presupposes that there be an entailment relationship between arriving and going on the stage. Therefore, (i) might be a case where a scalarity requirement needs to be invoked, though I am not sure whether or not other aspects of the question-answer relationship would presuppose this entailment independently.

[8] As far as I can see, the point I am making is independent of whether the givenness-operator is present in the syntax or not. Schwarzschild (1999) assumes the latter.

[9] In fact, the global account seems to fare better with (i). It seems to me that here many can be destressed, but the implicature not all is still present.

(i) a. Who read many or all books?

b. Mary read many books.

Lee (2004 and p.c.), however, raises a second interesting issue concerning intonation, which might provide an argument in favor of an account of embedded implicatures separate of that of implicatures at the utterance level. Namely, Lee shows that the intonation employed in examples with embedded implicatures such as (58) (repeated from (3)) the intonation on the scalar word many is more complex than a plain focus, and therefore Lee calls it a contrastive focus.

(58) They didn't play many of Beethoven's symphonies. They played all of them.

With implicatures at the utterance level the complex intonation is not required according to my understanding of Lee (2004). The difference in intonation is an interesting discovery that seems to support the idea that implicatures can arise in two different ways, only one of which can take place in an embedded position. However, it seems that the local account as I assumed must be modified to accommodate Lee's discovery. Nevertheless, Lee's discovery could be integrated quite easily within the system I developed in this paper where embedded implicatures are due to silent ONLY. Namely, it could be that the contrastive focus accent Lee has identified on many in (58) is licensing silent ONLY via a syntactic mechanism. Specifically, the contrastive focus accent might need to check its feature with a silent ONLY.[10]

In sum, then, the considerations in this conclusion have argued the following: It is difficult to find evidence bearing on the difference between the two accounts concerning scalarity and intonation, but promising. I unfortunately have to leave a careful investigation of these issues to future work. For the four properties of implicatures that I investigated in the section 2, on the the other hand, actual empirical differences seem to exist, and therefore I focussed on these for now.

[10]This seems in an interesting way related to the uncertainty requirement with topic accent that Ward & Hirschberg (1985) point out. In both cases, the intonation triggers syntactically the presence of a clausal focus-sensitive operator.

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